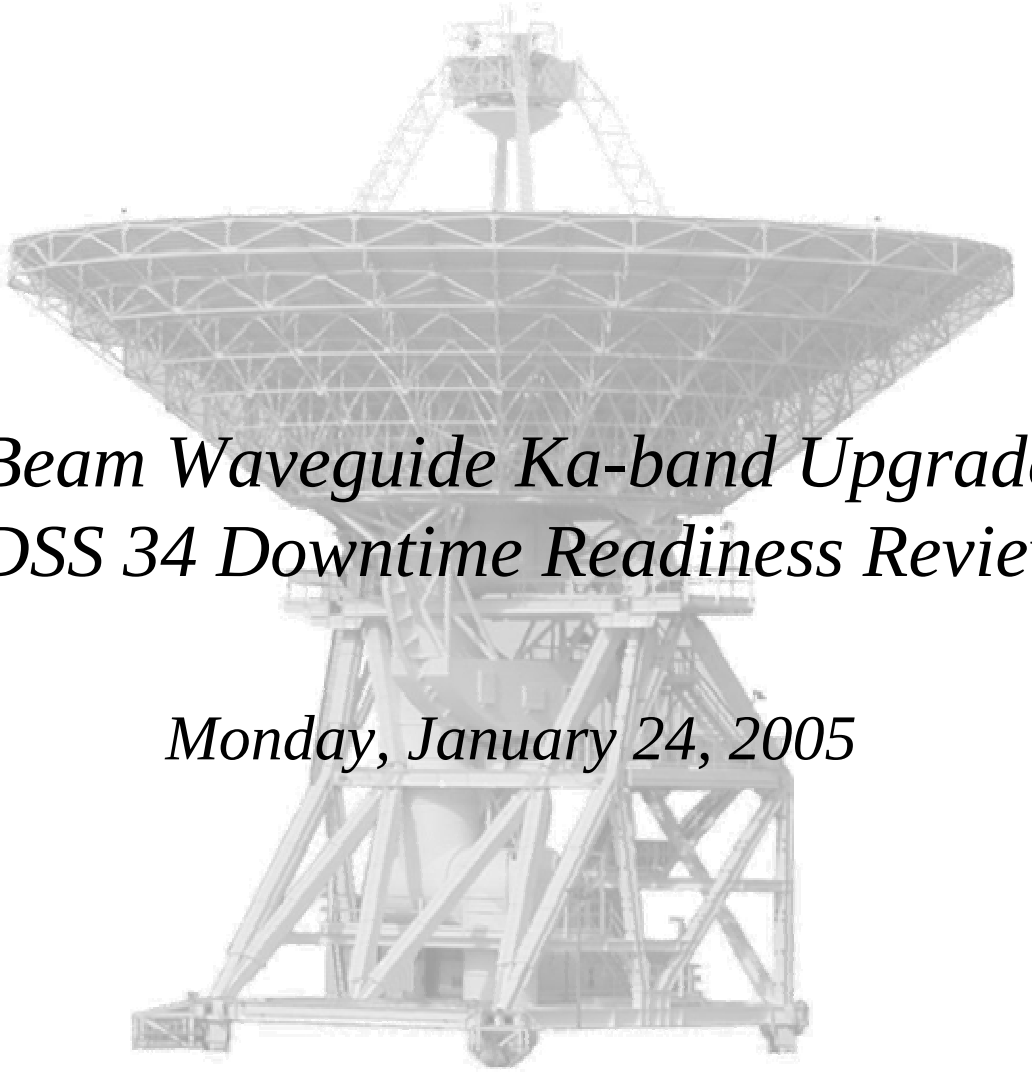
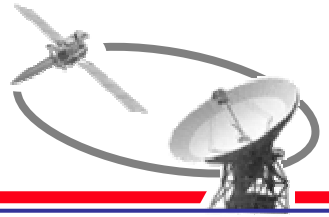


34-m Beam Waveguide Ka-band Upgrades Task
DSS 34 Downtime Readiness Review

Monday, January 24, 2005



Review Board

- Eugene Burke - RAPSO, Board Chairperson
- Dennis Buck - Antenna Front End & Science Support Mgr, Office 923
- Allan Berman - Service Management Mgr, Office 921
- Charles Klose - Infrastructure, Verification & Validation Mgr, Office 924
- Michael Coluzzi - ITT, O&M Contractor Network Engineering Manager
- Jean Patterson - Division 33 Representative to IND
- Ed Kruzins - CDSCC Representative, System Engineering (via telecon)
- John Murray - CDSCC Representative, Antenna Microwave (via
- telecon)
- Fred Battle - DSMS Safety Engineer
- Bob Sniffin - Board Secretary

Agenda

Topic	Time	Presenter
Introduction	1:00	Board Chair
Ka-band Upgrade Task Overview –	1:10	Watt Veruttipong
Equipment Modifications		
Feed Equipment	1:20	John Sosnowski
Microwave Control Equipment & Software	1:35	Chris Link
Low Noise Amplifier Equipment & Software	1:45	Jan Loreman
Exciter	1:55	Juan Lezameta
Downlink Tracking and Telemetry	2:00	Chau Buu
Antenna & Facility	2:05	Asim Sehic
Break	2:20	
Installation, Integration, and Engineering Tests	2:35	John Sosnowski
System Performance and Project Interface Tests	2:55	Sherill Hampton
Summary	3:15	Watt Veruttipong
Discussion	3:20	Review Board

Board Responsibilities

- The Review Board Chair is responsible for moderating the review and producing the review report and recommendations.
- The Review Board Members are responsible for reviewing the presentation material, actively participating at the review, and providing comments for the board report.
- Recommendations for Action should be submitted for consideration using the RFA forms provided.

DTRR Purpose & Objectives

- Purpose: Evaluate and confirm the readiness of the implementation task and station personnel to support the Ka-band Upgrades Task implementation at DSS-34.
- Specifically, the Review Board shall:
  - Confirm that all resources, tools, and products necessary to accomplish downtime activities are available on site, and that the downtime activities can be successfully accomplished with a high probability.
  - Confirm that new capabilities resulting from downtime modifications have undergone adequate testing, and that the probability is high that these capabilities will be successfully provided.
  - Confirm that no degradation to existing functionality or operability will occur as a result of the planned modifications.
  - Verify that a detailed plan and schedule for the downtime activities has been generated and peer-reviewed.
  - Recommend any changes in plan necessary for reducing risk to an acceptable level.

Timing and Entry Criteria

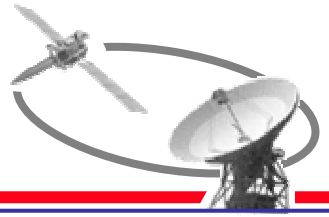
- Equipment Transfer Agreements (ETAs) for all applicable hardware initiated, with referenced Maintenance and Sparing Agreements (MSAs)
- All applicable hardware modkits have been shipped from DSN Logistics Facility by time of DTRR
- Detailed schedule of planned activities for requested downtime is available
- All known, open anomalies are in AAMS
- System Performance Test (SPT) procedures are released.

Success Criteria

- The detailed schedule is credible, and supporting personnel are available.
- Hardware modkits are onsite at least 2 weeks before start of downtime.
- All planned pre-installation testing of hardware is complete.
- Installation instructions are complete, and have been reviewed by the Operations Engineer and site engineering personnel.
- Spares shipment to the site is per the MSA.
- On-site facilities, tools, and personnel are available.
- Training materials are ready for release, and training sessions have been scheduled consistent with the planned return-to-service date.

Ka-band Upgrade Task Overview

Watt Veruttipong



Ka-band Upgrades Task Overview

- Purpose
  - Provide Ka-band receive capability on DSS-26, DSS-34, DSS-24, and DSS 54
  - Improve X-band performance at these stations
- Status
  - DSS-26 is implemented and operational at X-band
  - Complete Ka-band operational status awaits pointing improvements and demonstration of monopulse pointing with a Ka-band spacecraft
  - DSS-34 downtime scheduled for February 15, 2005 to April 10, 2005
    - A downtime extension to April 24, 2005 has been requested to accommodate Australian holidays and to provide contingency within the downtime

Ka-band Upgrades Task Overview – Dependencies

- ECOs needed for X/X/Ka Upgrade that were not under Task control
  - 99.0002, 111.102
    - Installs network interface upgrade on AMC Assemblies
    - Required to route monopulse error signal to AMC
    - Received on site 12/18/2002, Installed 2/28/2004, Awaiting WA as of 1/18/2005
  - 00.0049, 323.202B
    - LAN Extension to antenna pedestal room
    - Required to get monopulse error signal to AMC
    - Received on site 9/25/2002, Installed 7/31/2003, Awaiting WA as of 1/18/2005
  - 02.0007, 110.101
    - Replace OS/2 Microwave Generic Controllers with Sun-based Microwave Subsystem Controllers (USCs)
    - Received on site 12/21/2004
  - ECO Unknown (at time of chart preparation)
    - Installs system cables between DTT and FSP
    - Required for stability testing of X/X/Ka installation
    - It is believed an ECO was written by Les White in 2002 and parts ordered but not shipped
    - Les White has been requested to expedite a solution

Microwave Feed Equipment

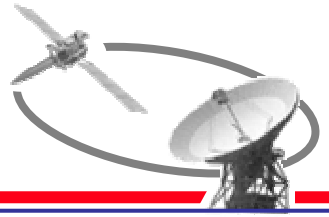
John Sosnowski

Microwave Feed Equipment

- ECO 99.0002, 110.403 H
  - Description – Provides hardware to modify the existing S-band Frame to allow clearance for the X/X/Ka installation
  - Shipping Status
    - Shipped to DLF 12/27/2004
    - Received at CDSCC 1/12/2005
  - MESkit Status – Shipped to DLF 12/29/2004
  - Installation Procedure Status – 868-000105, Rev. B, is pre-released, in signature cycle
  - Training Status – Waiting for equipment installation
  - Liens – 868-000105, Rev. B is pre-released
  - Comments – This modification may be installed prior to, or concurrently with ECO 99.0002, 110.403 I

Microwave Feed Equipment

- ECO 99.0002, 110.403 I
  - Description – Provides hardware to modify the existing X-band Platform and install mounting supports for X/X/Ka equipment in accordance with JPL drawing 9620750 (FEG, X/X/Ka Platform-Utility and Assembly Mounting Supports). Hardware depicted on JPL drawing 9620750 complies with JPL drawing 9618431 Item 11.
  - Shipping Status
    - Shipped to DLF 12/27/2004
    - Received at CDSCC 1/12/2005
  - MESkit Status – Shipped to DLF 12/29/2004
  - Installation Procedure Status – 868-000105, Rev. B is pre-released, in signature cycle
  - Training Status – Waiting for equipment installation
  - Liens – 868-000105, Rev. B is pre-released
  - Comments – This modification requires prior or concurrent installation of ECO 99.0002, 110.403 H



Microwave Feed Equipment

- ECOs 99.0002, 110.403 L and 99.0002, 110.403 M
  - Description – Provides FEG hardware to be mounted on the X-band platform. Hardware conforms to JPL drawing 9618431 (X/X/Ka Beam Waveguide UWV Assembly). JPL drawing 9618431 Item 18 (Horn Aperture Load Assembly) and Item 42 (X-band Transmitter Waveguide Run)
  - Shipping Status
    - Shipped to DLF 12/27/2004
    - Received at CDSCC 1/11/2005 (L) and 1/18/2005 (M)
  - MESkit Status
    - Shipped to DLF 12/29/2004
    - Not received at CDSCC as of 1/18/2005
  - Installation Procedure Status – 868-000105, Rev. B is pre-released, in signature cycle
  - Training Status – Waiting for equipment installation
  - Liens – 868-000105, Rev. B is pre-released
  - Comments – These modifications require prior or concurrent installation of ECO 99.0002, 110.403 I

Microwave Support Equipment, Control Equipment and Software

Chris Link

Microwave Support Equipment

- ECO 99.0002, 110.409 A – Provides Nitrogen Pressurization Assembly and the support frame for it and the Waveguide Cooling Manifold
- ECO 99.0002, 110.410 I – Provides Waveguide Cooling Manifold Assembly
- ECO 99.0002, 110.603 B – Provides X/X/Ka Cable Package
- Status (Applies to all three mod kits)
  - Shipping Status
    - All modkits shipped to DLF 12/30/2004
    - 110.409 A and 110.410 I – received at CDSCC 1/20/2005
    - 110.603 B – received at CDSCC 1/18/2005
  - MSA – MSA is not required
  - Installation Procedure – 868-000105, Rev. B (34m BWG Feed Equipment Group (FEG) X/X/Ka Feed & Ancillary Equipment Installation), is pre-released, in signature cycle
  - Training – No training is required
  - Liens – None

Microwave Control Equipment

- ECO 99.0002, 110.101B
  - Description – Provides Configuration Control Group (CCG) Interface Assembly to control and monitor additional microwave equipment
  - Shipping Status
    - Delivered to DLF 12/28/2004
    - Received at CDSCC on 1/20/2005
  - MSA Status – MSA-9 Released 1/22/2005
  - MESkit Status – Delivered to DLF 12/30/2004
  - Installation Procedure – 868-000105, Rev. B (34m BWG Feed Equipment Group (FEG) X/X/Ka Feed & Ancillary Equipment Installation), is pre-released, in signature cycle
  - Training – No additional training (new equipment replicates equipment already used at station)
  - Liens – None

Microwave Control Equipment

- ECO 99.0002, 110.109 B
  - Description – Provides Aperture Load Controller and Aperture Load Coupling assembly
  - Shipping Status
    - Delivered to DLF 12/28/2004
    - Received at CDSCC on 1/20/2005
  - MSA Status – MSA-9 Released 1/22/2005
  - MESkit Status – Delivered to DLF 12/30/2004
  - Installation Procedure – 868-000105, Rev. B (34m BWG Feed Equipment Group (FEG) X/X/Ka Feed & Ancillary Equipment Installation), is pre-released, in signature cycle
  - Training – No training is required
  - Liens – None

Microwave Control Software

- ECO 99.0002, 110.104 B
  - Description – Provides CCG Programmable Logic Controller (PLC) firmware to support X/X/Ka configuration
  - Shipping Status
    - Delivered to DLF 1/13/2005
    - Not received at CDSCC as of 1/21/2005
  - SWTA Status – Delivered by SWTA Addendum
  - RDD Status – RDD 888-000213 (Programmable Logic Controller (PLC) Ladder Logic Program) Released
  - Training Status – No additional training required for firmware revision

Microwave Control Software

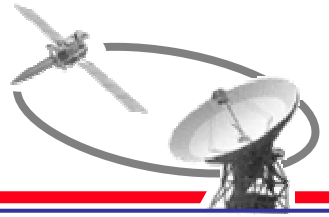
- Aperture Load Motor Software
  - ECO 99.0002, 110.110 B Provides Aperture Load Motor Firmware
  - ECO 99.0002, 110.111 C Provides Aperture Load Monitor Software
  - Shipping Status – Both mod kits delivered to DLF 1/18/2005
  - SWTA Status – Delivered by SWTA Addendum
  - RDD Status
    - RDD 888-000219 (Aperture Load Motor Firmware Program) Released
    - RDD 888-000220 (Aperture Load Motor Monitor Program) Released
  - Training Status – Not required

Low Noise Amplifier Equipment and Software

Jan Loreman

Low Noise Amplifier Equipment

- ECO 99.0002, 110.202
  - Description – Provides one installed set of X/Ka-band Low Noise Amplifiers (LNAs) and one on-site spare set (in spare cryo package)
  - Shipping Status
    - Shipped to DLF 12/16/2004
    - Received at CDSCC 1/18/2005
  - MESkit Status – Shipment to DLF planned for 1/24/2005
  - Installation Procedure Status – None required. LNAs are delivered installed in primary and spare cryo packages that are installed as part of FEG Installation (Procedure 868-000105, Rev. B, in release cycle)
  - Training Status – This equipment is very similar to the Dual X-band LNA equipment at the 70-m DSS. The performance of the acceptance test procedure (869-000117, released 11/4/2003), in conjunction with the OMM will provide the training.
  - Liens – None
  - Comments – Spare LNAs have been held at JPL for phase stability testing



Low Noise Amplifier Equipment

- ECO 99.0002, 110.203
  - Description – Provides refrigeration equipment including one installed Helium compressor and one spare
  - Shipping Status
    - Shipped to DLF on 12/14/2004
    - Received at CDSCC on 1/7/2005
  - MESkit Status – Shipment to DLF planned for 1/28/2005
  - Installation Procedure Status – Installed as part of FEG Installation (Procedure 868-000105, Rev. B, in release cycle)
  - Training Status – This equipment is very similar to the Dual X-band LNA equipment at the 70-m DSS. The performance of the acceptance test procedure (869-000117, released 11/4/2003), in conjunction with the OMM will provide the training.
  - Liens – None
  - Comments – Spare vacuum pump and compressor have been held at JPL for phase stability testing of spare LNA

Low Noise Amplifier Equipment

- ECO 99.0002, 110.204
  - Description – Provides LNA Instrumentation cabinet and spares
  - Shipping Status
    - Shipped to DLF 12/14/04
    - Received at CDSCC on 1/7/2005
  - MESkit Status – Shipment to DLF planned for 1/28/2005
  - Installation Procedure Status – Installed as part of FEG Installation (Procedure 868-000105, Rev. B, in release cycle)
  - Training Status – This equipment is very similar to the Dual X-band LNA instrumentation equipment at the 70-m DSS. The performance of the acceptance test procedure (869-000117, released 11/4/2003), in conjunction with the OMM will provide the training.
  - Liens – None

Low Noise Amplifier Software

- ECO 99.0002, 110.209
  - Description – Provides instrumentation software to support local and remote operation of LNAs
  - Shipping Status – Paperwork Transfer Only
  - SOM Status – OMM 867-000049 Released 4/26/2004
  - RDD Status – RDD 888-000133, Rev. A Released 10/22/2003
  - Anomalies – None
  - Comments – (OMM serves as SOM)

Downlink Tracking and Telemetry Equipment

Chau Buu

Downlink Tracking and Telemetry Equipment

- Modification consists of ECOs written against ECR 99.0002. The ECOs are identified as 201.113 F, 201.113 G, 201.203 A, 201.204 A
  - Control Room Modifications – Increases receiver IF distribution, installs dual-channel IF-to-Digital Converters and Monopulse DSP boards in Downlink Channels, revises DTT cabling in SPC
  - Antenna Modifications – Adds Ka-band Noise Diode Controller and IF Fiber Optic Transmitter to Receiver Antenna Equipment Cabinet (RAEC), installs X/Ka-band Upconverter, Ka-band Dual-channel Downconverter, and Ka-band Noise Diode Assembly, revises DTT cabling in antenna
  - Shipping Status
    - All mod kits received at Station between 11/1/2004 and 11/18/2004
    - MESkits for Ka-band Noise Diodes and X/Ka Upconverter received 11/1/2004 and 11/12/2004
  - MSA Status – Released prior to DSS 26 installation ($\approx$ 2 years ago)
  - Installation Procedure Status – 868-000196 released 8/2004
  - Training Status – SOP and training material is available. On-site training for monopulse operation by JPL Engineering personnel is planned.
  - Liens – None

Exciter Equipment

Juan Lezameta

Exciter Equipment

- ECOs 99.0002, 212.201B and 99.0002, 212.113A
  - Description – Four ECO kits provide X to Ka-band antenna RF assemblies and cables for installation as integral parts of the Block V Exciter at the DSS-34 BWG antenna and SPC.
    - 212.113A at DSS-34, X-band and Ka-band waveguide sections, waveguide support hardware, and cable assemblies
    - 212.113A at SPC-40, BVE X to Ka Translator and Zero Delay Device (ZDD) cable assemblies
    - 212.201B at DSS-34, BVE Wideband X to Ka Translator Assembly & X to Ka ZDD Assembly
    - 212.201B at SPC-40, BVE Wideband X to Ka Translator LO IF Assembly
  - Shipping Status
    - Delivered to DLF on 11/18/2004
    - Not received at CDSCC as of 1/21/2005
  - MSA Status – signed by OE on 9/10/2002
  - MESkit Status – delivered to DLF on 12/7/2004
    - Wideband X to Ka Antenna RF Assembly part number 9614800
    - Wideband X to Ka Translator LO IF Assembly part number 9615315
  - Installation Procedure Status – 868-000229 released 11/09/2004
  - Training Status –
    - Training material and tools are near completion.
    - On-site training by JPL Engineering for X to KA Translator and X to Ka-band ZDD is planned
  - Liens – None

Antenna Equipment

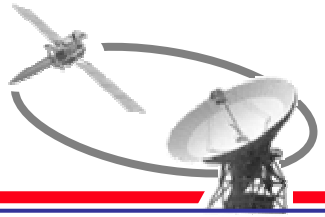
Asim Sehic

Antenna Equipment

- ECO 99.0002, 106.103 B
  - Description – Modifies lower pedestal shroud to accept X/X/Ka Feed Assembly
  - Shipping Status
    - Shipped to DLF 1/3/2005, Priority 02
    - Received in Sydney on 1/20/2005
  - MSA Status – Does not require maintenance or spares
  - Installation Procedure Status – 868-000106, Rev A released 12/27/2004
  - Training Status – Training is not required
  - Liens – None

Antenna Equipment

- 99.0002, 106.401 B
  - Modifies air conditioning to provide additional heat extraction for Sumitomo® Helium compressor and improves chilled water piping.
  - Shipping Status
    - Received at CDSCC 12/30/2004
  - MSA Status – Does not require maintenance or spares
  - No formal procedure is needed (Facilities people work from construction drawings)
  - Training Status – Training is not required
  - Liens – None



Antenna Equipment

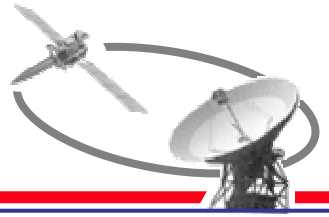
- ECO 99.0002, 106.401 C
  - Description – Installs new pumps on Waveguide Cooling Skid to improve coolant flow to X/X/Ka Feed and waveguide.
  - Shipping Status – Hardware expected at DLF on 1/14/2005, Will be shipped to CDSCC, Priority 02, on 1/18/2005.
  - MSA Status – In process
  - Installation Procedure Status – n/a
  - Training Status – Training is not required
  - Comments – Implementation can be made operational without this ECO

Antenna Equipment

- ECO 99.0002, 106.402 A and B
  - Description – Modifies power distribution to support Sumitomo® compressors and provide additional circuits for X/X/Ka equipment.
  - Shipping Status
    - 106.402A Received at CDSCC 2/18/2003
    - 106.402B Received at CDSCC 12/13/2004
  - MSA Status – n/a (~20% additional hardware provided with modkit)
  - Installation Procedure Status – No formal procedure is needed (Facilities people work from construction drawings)
  - Training Status – Training is not required

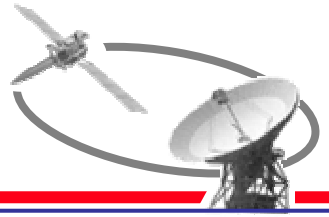
Installation, Integration and Engineering Tests

John Sosnowski



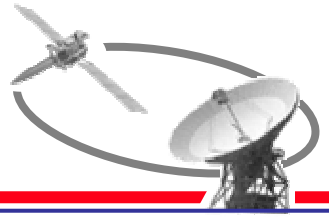
Installation, Integration, and Engineering Tests

- Scheduled Downtime 2/15/05 – 4/10/05
  - Modifications
    - Modify S-band feed frame for XXKa clearance
    - Install new S-band shroud interface
    - Modify shroud to new improved design at the XXKa position
    - XXKa feed and support hardware
    - XKa LNA, cryogenics, instrumentation
    - Install new CCG control, Software and Ladder Logic
    - DTT modifications to support Ka monopulse
    - BVE additions to support X to Ka translations and Ka ZDD
    - Additional power distribution
  - Station Activities
    - Idler wheel modifications
    - Antenna painting



Installation, Integration, and Engineering Tests

- Preparation activities
  - Baselines
    - Gain, efficiency, and pointing of existing configuration
      - Dish panels have been replaced since last measurements
    - S/X beam coincidence
  - DTT Ka Installations
    - DTT fiber optic installations (Ka-band IFs)
    - Add noise diode controller for Ka-band
    - Add IF Distribution Equipment for DSS-34 Ka-band
    - Modify DTT Downlink Channels to support Monopulse
    - Modify RTSG for Ka-band Support



Installation, Integration, and Engineering Tests

- Schedule
  - CDSCC has reviewed schedule and agrees with manpower and durations
  - Antenna, FEG, and CCG CDEs will be on site to respond to installation issues
  - Key Milestones

• Installations	16d	2/15/05	3/9/05
• Hardware & Software Tests	15d	3/9/05	4/4/05
• Antenna Calibrations	22d	3/2/05	4/7/05
• SPTs	5d	3/31/05	4/7/05
• Demonstration Tracks	5d	4/7/05	4/11/05*
• End of Downtime	0d		4/11/05*
• Customer Review	2d	4/11/05	4/13/05

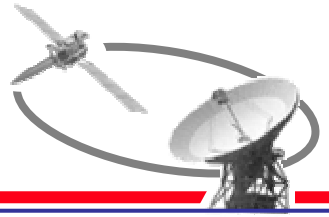
  - (*) Schedule exceeds planned downtime by 1 day with no contingency. A downtime extension request is in process.

System Performance and Project Supported Tests

Sherill Hampton

System Performance Tests

- ITT recommends that the following System Performance Tests (SPTs) be conducted before return to service
  - System Performance Tests
    - Allan Deviation and Phase Noise on S-, X-, and Ka-bands
    - Ramping Doppler Test on S- and X-bands
    - Downlink Gain and Bandwidth for X- and Ka-bands
    - Zero-delay measurements for X/X- and X/Ka-band operation
    - Ranging Error Test for X/X- and X/Ka-band operation
    - Ranging Noise Test for X/X- and X/Ka-band operation
    - Telemetry Bit Error Rate tests for S-, X-, and Ka-bands
    - Telemetry data delay measurement for X- and Ka-bands



System Performance Tests

- Approximate time needed for conducting SPTs
  - Allan Deviation and Phase Noise – 12 hours per band
  - Ramping Doppler Test – 4 hours per band
  - Downlink Gain and Bandwidth – 4 hours per band
  - Zero-delay measurements – 6 hours per band
  - Ranging Error Test – 2 hours per band
  - Ranging Noise Test – 10 hours per band
  - Telemetry Bit Error Rate tests – 8 hours per band
  - Telemetry data delay measurement – 2 hours per band
- Total test time, without contingency, is 116 hours

Project Supported Tests

- ITT recommends that the following tests requiring Project support be conducted before return to service
  - S-band Two-way Demonstration Track
  - X-band Two-way Demonstration Track
  - Ka-band downlink (or X-up, Ka-down) Demonstration Track provided Ka-band spacecraft is available
- Tests will be scheduled by the cognizant OE with the participation of the Network Operations Project Engineer(s) (NOPEs) for the participating project(s)
- Total test time, without contingency, is 36 hours

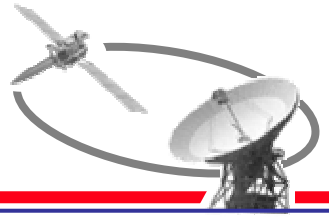
34-m BWG Ka-band Upgrades Task
DSS-34 Downtime Readiness Review

Summary

Watt Veruttipong

Summary

- All Mod Kits, MesKits, and Installation Procedures planned for installation during downtime are on site or in transit
  - 21 out of 28 Mod Kits were in Australia as of 1/21/2005
  - Pre-release version of FEG procedure will be used if signature cycle is not completed.
- All specialized training has been identified and will be conducted at the station
- Station has committed to supplying required installation support
- The Task is ready to begin this implementation!



Abbreviations and Acronyms

AAMS	Automated Anomaly Management System
AMC	Antenna Monitory and Control (Assembly)
BVE	Block V Exciter
CCG	Configuration Control Group
CDE	Cognizant Development Engineer
CDSCC	Canberra Deep Space Communications Complex
DLF	DSN Logistics Facility
DSMS	Deep Space Mission System
DSN	Deep Space Network
DSP	Digital Signal Processor (or Processing)
DSS	Deep Space Station
DTRR	Downtime Readiness Review
DTT	Downlink Tracking and Telemetry (Subsystem)
ECO	Engineering Change Order
ECR	Engineering Change Request
ETA	Equipment Transfer Agreement
FEG	Feed Equipment Group
FSP	Full Spectrum Processing (Subsystem)
IF	Intermediate Frequency
IND	Interplanetary Network Directorate
JPL	Jet Propulsion Laboratory
LNA	Low Noise Amplifier
LO	Local Oscillator
MES	Maintenance Equipment and Spares
MSA	Maintenance and Sparing Agreement
NOPE	Network Operations Project Engineer
O&M	Operations and Maintenance
OE	Operations Engineer
OMM	Operations and Maintenance Manual
PLC	Programmable Logic Controller
RAEC	Receiver Antenna Equipment Cabinet
RAPSO	Resource Allocation, Planning, and Scheduling Office
RDD	Release Description Document
RFA	Request for action
RTSG	Receiver Test Signal Generator
SOM	Software Operations Manual
SOP	Standard Operations Procedure
SPC	Signal Processing Center
SPT	System Performance Test
SWTA	Software Transfer Agreement
TBD	To be determined
USC	Microwave Subsystem Controller
UWV	Microwave (Subsystem)
WA	Workmanship Assurance
ZDD	Zero-delay Device